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APPLICATION NO.	FILING DATE	FIRST NAMED INVENTOR	ATTORNEY DOCKET NO.	CONFIRMATION NO.
09/811,653	03/19/2001	Dietrich Klakow	DE00046	7775

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EXAMINER	
LERNER, MARTIN	
ART UNIT	**PAPER NUMBER**
2654	8

DATE MAILED: 02/03/2004

Please find below and/or attached an Office communication concerning this application or proceeding.

Office Action Summary	Application No.	Applicant(s)
	09/811,653	KLAKOW ET AL.
	Examiner	Art Unit
	Martin Lerner	2654

-- The MAILING DATE of this communication appears on the cover sheet with the correspondence address --

Period for Reply

A SHORTENED STATUTORY PERIOD FOR REPLY IS SET TO EXPIRE 3 MONTH(S) FROM THE MAILING DATE OF THIS COMMUNICATION.

- Extensions of time may be available under the provisions of 37 CFR 1.136(a). In no event, however, may a reply be timely filed after SIX (6) MONTHS from the mailing date of this communication.
- If the period for reply specified above is less than thirty (30) days, a reply within the statutory minimum of thirty (30) days will be considered timely.
- If NO period for reply is specified above, the maximum statutory period will apply and will expire SIX (6) MONTHS from the mailing date of this communication.
- Failure to reply within the set or extended period for reply will, by statute, cause the application to become ABANDONED (35 U.S.C. § 133).
- Any reply received by the Office later than three months after the mailing date of this communication, even if timely filed, may reduce any earned patent term adjustment. See 37 CFR 1.704(b).

Status

1)☒ Responsive to communication(s) filed on *26 November 2003*.

2a)☒ This action is **FINAL**. 2b)☐ This action is non-final.

3)☐ Since this application is in condition for allowance except for formal matters, prosecution as to the merits is closed in accordance with the practice under *Ex parte Quayle*, 1935 C.D. 11, 453 O.G. 213.

Disposition of Claims

4)☒ Claim(s) *1 to 11* is/are pending in the application.

4a) Of the above claim(s) _____ is/are withdrawn from consideration.

5)☐ Claim(s) _____ is/are allowed.

6)☒ Claim(s) *1 to 11* is/are rejected.

7)☐ Claim(s) _____ is/are objected to.

8)☐ Claim(s) _____ are subject to restriction and/or election requirement.

Application Papers

9)☐ The specification is objected to by the Examiner.

10)☐ The drawing(s) filed on _____ is/are: a)☐ accepted or b)☐ objected to by the Examiner.

Applicant may not request that any objection to the drawing(s) be held in abeyance. See 37 CFR 1.85(a).

Replacement drawing sheet(s) including the correction is required if the drawing(s) is objected to. See 37 CFR 1.121(d).

11)☐ The oath or declaration is objected to by the Examiner. Note the attached Office Action or form PTO-152.

Priority under 35 U.S.C. §§ 119 and 120

12)☒ Acknowledgment is made of a claim for foreign priority under 35 U.S.C. § 119(a)-(d) or (f).

a)☒ All b)☐ Some * c)☐ None of:

1.☒ Certified copies of the priority documents have been received.

2.☐ Certified copies of the priority documents have been received in Application No. _____.

3.☐ Copies of the certified copies of the priority documents have been received in this National Stage application from the International Bureau (PCT Rule 17.2(a)).

* See the attached detailed Office action for a list of the certified copies not received.

13)☐ Acknowledgment is made of a claim for domestic priority under 35 U.S.C. § 119(e) (to a provisional application) since a specific reference was included in the first sentence of the specification or in an Application Data Sheet. 37 CFR 1.78.

a) ☐ The translation of the foreign language provisional application has been received.

14)☐ Acknowledgment is made of a claim for domestic priority under 35 U.S.C. §§ 120 and/or 121 since a specific reference was included in the first sentence of the specification or in an Application Data Sheet. 37 CFR 1.78.

Attachment(s)

1) ☐ Notice of References Cited (PTO-892)

2) ☐ Notice of Draftsperson's Patent Drawing Review (PTO-948)

3) ☒ Information Disclosure Statement(s) (PTO-1449) Paper No(s) 6.

4) ☐ Interview Summary (PTO-413) Paper No(s). _____.

5) ☐ Notice of Informal Patent Application (PTO-152)

6) ☐ Other: .

DETAILED ACTION

Claim Rejections - 35 USC § 102

1. The following is a quotation of the appropriate paragraphs of 35 U.S.C. 102 that form the basis for the rejections under this section made in this Office action:

> A person shall be entitled to a patent unless –
>
> (a) the invention was known or used by others in this country, or patented or described in a printed publication in this or a foreign country, before the invention thereof by the applicant for a patent.
>
> (e) the invention was described in a patent granted on an application for patent by another filed in the United States before the invention thereof by the applicant for patent, or on an international application by another who has fulfilled the requirements of paragraphs (1), (2), and (4) of section 371(c) of this title before the invention thereof by the applicant for patent.

2. Claims 1 to 6, 8, 10, and 11 are rejected under 35 U.S.C. 102(a) as being clearly anticipated by *Klakow ("Selecting articles from the language model training corpus").*

3. Applicants cannot rely upon the foreign priority papers to overcome this rejection because a translation of said papers has not been made of record in accordance with 37 CFR 1.55. See MPEP § 201.15.

4. Claims 7 and 9 are rejected under 35 U.S.C. 102(e) as being anticipated by *Ramaswamy et al.*

Regarding independent claim 7, *Ramaswamy et al.* discloses a method of building language models for speech recognition, wherein:

"a text corpus part of a given first text corpus is gradually extended by one or various other text corpus parts of the first text corpus in dependence on text data of an

application-specific text corpus to form a second text corpus until a predefined criterion is met and in that the values of the language model are generated while the second text corpus is used" – language model constructor 50 reads linguistic units from seed corpus 10 and constructs an initial reference language model 80 from these linguistic units; once an initial reference language model 80 ("a first text corpus") is constructed, iterative corpus extractor 60 reads linguistic units ("one or various text corpus parts") from external corpus 20 and computes a relevance score for each linguistic unit in accordance with language model 80; an iterative language model building technique generates a final language model 90 ("a second text corpus") from a small, domain-restricted seed corpus 15 ("in dependent on text data of an application-specific text corpus") and a large, less restricted external corpus 20; the linguistic units in seed corpus 15 are all highly relevant to a common domain or field ("an application-specific text corpus"), and external corpus 20 contains text data that is less relevant to the domain of interest than the data within the seed corpus; final language model 90 is used in language processing applications (column 2, line 40 to column 3, line 63: Figures 1 and 2); when a sufficient number "n" of linguistic units have been so extracted ("until a predefined criterion is met"), language model constructor 50 uses all the data in seed corpus 15 and relevant corpus 40 to construct a new reference language model 80 in step S4; the number n can either be a predetermined fixed number or a number that dynamically varies with each language model building iteration; for example, n may be set based upon a target percentage change in the size of the relevant corpus, so that the current iteration (of adding linguistic units to relevant corpus 40) can be considered

complete if relevant corpus 40 increases by a certain percentage; also, model checker 70 evaluates the language model quality, calling for further language building iterations, if necessary, until its quality is satisfactory ("until a predefined criterion is met") (column 3, line 45 to column 4, line 7: Figures 1 and 2).

Regarding independent claim 9, *Ramaswamy et al.* discloses a method of building language models for speech recognition, wherein:

"a part of a given acoustic training material, which represents a multitude of speech utterances, is gradually extended by one or more parts of the given acoustic training material and in that the acoustic references of the acoustic model are formed by means of the accumulated parts of the given acoustic training material" – language model constructor 50 reads linguistic units ("one or more parts of the given acoustic training material") from seed corpus 10 and constructs an initial reference language model 80 from these linguistic units; once an initial reference language model 80 is constructed, iterative corpus extractor 60 reads linguistic units from external corpus 20 and computes a relevance score for each linguistic unit in accordance with language model 80, and incrementally increases the size of the initial reference language model 80 ("is gradually extended by one or more parts of the given acoustic training material"); an iterative language model building technique generates a final language model 90 ("the acoustic model") from a small, domain-restricted seed corpus 15 and a large, less restricted external corpus 20; the linguistic units in seed corpus 15 are all highly relevant to a common domain or field, and external corpus 20 contains text data that is less

relevant to the domain of interest than the data within the seed corpus; final language model 90 is used in language processing applications (column 2, line 40 to column 4, line 7: Figures 1 and 2); implicitly, linguistic units are acoustic units in speech recognition.

Claim Rejections - 35 USC § 103

5. The following is a quotation of 35 U.S.C. 103(a) which forms the basis for all obviousness rejections set forth in this Office action:

> (a) A patent may not be obtained though the invention is not identically disclosed or described as set forth in section 102 of this title, if the differences between the subject matter sought to be patented and the prior art are such that the subject matter as a whole would have been obvious at the time the invention was made to a person having ordinary skill in the art to which said subject matter pertains. Patentability shall not be negatived by the manner in which the invention was made.

6. Claims 1, 2, 5/1, 5/2, 6/5/1, 6/5/2, 8, 10, and 11 are rejected under 35 U.S.C. 103(a) as being unpatentable over *Ramaswamy et al.* in view of *Bandara et al.*

Regarding independent claim 1, *Ramaswamy et al.* discloses a method of generating a language model for speech recognition, wherein:

"a first text corpus is gradually [reduced] by one or more various text corpus parts in dependence on text data of an application-specific second text corpus until a predefined criterion is met" – language model constructor 50 reads linguistic units from seed corpus 10 and constructs an initial reference language model 80 from these linguistic units; once an initial reference language model 80 ("a first text corpus") is constructed, iterative corpus extractor 60 reads linguistic units ("one or various text corpus parts") from external corpus 20 and computes a relevance score for each linguistic unit in accordance with language model 80; an iterative language model

building technique generates a final language model 90 from a small, domain-restricted seed corpus 15 ("in dependence on text data of an application-specific second text corpus") and a large, less restricted external corpus 20; the linguistic units in seed corpus 15 ("an application-specific second text corpus") are all highly relevant to a common domain or field, and external corpus 20 contains text data that is less relevant to the domain of interest than the data within the seed corpus (column 2, line 40 to column 3, line 63: Figures 1 and 2); when a sufficient number "n" of linguistic units have been so extracted ("until a predefined criterion is met"), language model constructor 50 uses all the data in seed corpus 15 and relevant corpus 40 to construct a new reference language model 80 in step S4; the number n can either be a predetermined fixed number or a number that dynamically varies with each language model building iteration; for example, n may be set based upon a target percentage change in the size of the relevant corpus, so that the current iteration (of adding linguistic units to relevant corpus 40) can be considered complete if relevant corpus 40 increases by a certain percentage; also, model checker 70 evaluates the language model quality, calling for further language building iterations, if necessary, until its quality is satisfactory ("until a predefined criterion is met") (column 3, line 45 to column 4, line 7: Figures 1 and 2);

"in that the values of the language model are generated on the basis of the [reduced] first text corpus" – final language model 90 is used in language processing applications (column 2, line 40 to column 3, line 63: Figures 1 and 2).

Regarding independent claim 1, *Ramaswamy et al.* discloses a method of building language models by iteratively increasing the size of a language model by

adding units from a large external text corpus, where the added units are similar to linguistic units in a seed corpus. Thus, *Ramaswamy et al.* discloses gradually increasing the size of the language model but omits gradually reducing the size of the language model. Still, one of ordinary skill in the art would recognize that the language model building method of *Ramaswamy et al.* might be reversed in order gradually to reduce the size of the language model instead of gradually increasing its size. That is, the large external text corpus 20 may be gradually reduced when linguistic units iteratively are compared to, and found to be different from, those in the seed corpus. *Bandara et al.* teaches a method for adapting the size of a language model in a speech recognition system, where an acoustic distance is calculated, and the contents of the language model are reduced with respect to acoustic distance. (Column 5, Lines 20 to 63: Figure 2) The stated advantage is the size of the language model is reduced, while retaining accuracy. (Column 3, Line 56 to Column 4, Line 24) It would have been obvious to one having ordinary skill in the art to reverse the language model building process of *Ramaswamy et al.* as suggested by *Bandara et al.* for the purpose of reducing the size of the language model, while retaining recognition accuracy.

Regarding claim 2, *Bandara et al.* discloses calculating the language model parameters based upon trigram, bigram, and unigram probabilities (column 2, lines 20 to 67).

Regarding claim 5/1 and 5/2, *Ramaswamy et al.* discloses a test corpus ("test text") is used by model checker 70 to evaluate the language model quality, calling for

further language building iterations, if necessary, until its quality is satisfactory (column 3, lines 6 to 14; column 3, line 64 to column 4, line 7).

Regarding claim 6/5/1 and 6/5/2, *Ramaswamy et al.* discloses iterative corpus extractor computes a relevance score based upon a perplexity measure relative to a threshold to determine how many linguistic units to add to the language model (column 4, lines 7 to 54).

Regarding independent claim 8, *Ramaswamy et al.* discloses a method of generating a language model for speech recognition, wherein:

"acoustic training material representing a first number of speech utterances is gradually [reduced] until a predefined criterion is met by training material parts representing individual speech utterances in dependence on a second number of application-specific speech utterances" – language model constructor 50 reads linguistic units ("training material representing a number of speech utterances") from seed corpus 10 and constructs an initial reference language model 80 from these linguistic units; once an initial reference language model 80 ("a first number of speech utterances") is constructed, iterative corpus extractor 60 reads linguistic units from external corpus 20 and computes a relevance score for each linguistic unit in accordance with language model 80, and incrementally increases the size of the initial reference language model 80; an iterative language model building technique generates a final language model 90 from a small, domain-restricted seed corpus 15 ("in dependence on a second number of application-specific speech utterances") and a large, less restricted external corpus 20; the linguistic units in seed corpus 15 are all highly relevant to a common domain or field,

and external corpus 20 contains text data that is less relevant to the domain of interest than the data within the seed corpus (column 2, line 40 to column 4, line 7: Figures 1 and 2); implicitly, linguistic units are acoustic units in speech recognition; when a sufficient number "n" of linguistic units have been so extracted ("until a predefined criterion is met"), language model constructor 50 uses all the data in seed corpus 15 and relevant corpus 40 to construct a new reference language model 80 in step S4; the number n can either be a predetermined fixed number or a number that dynamically varies with each language model building iteration; for example, n may be set based upon a target percentage change in the size of the relevant corpus, so that the current iteration (of adding linguistic units to relevant corpus 40) can be considered complete if relevant corpus 40 increases by a certain percentage; also, model checker 70 evaluates the language model quality, calling for further language building iterations, if necessary, until its quality is satisfactory ("until a predefined criterion is met") (column 3, line 45 to column 4, line 7: Figures 1 and 2);

"in that the acoustic references of the acoustic model are formed by means of the [reduced] acoustic training material" – final language model 90 is used in language processing applications (column 2, line 40 to column 3, line 63: Figures 1 and 2).

Regarding independent claim 8, *Ramaswamy et al.* discloses a method of building language models by iteratively increasing the size of a language model by adding units from a large external text corpus, where the added units are similar to linguistic units in a seed corpus. Thus, *Ramaswamy et al.* discloses gradually increasing the size of the language model but omits gradually reducing the size of the

language model. Still, one of ordinary skill in the art would recognize that the language model building method of *Ramaswamy et al.* might be reversed in order gradually to reduce the size of the language model instead of gradually increasing its size. That is, the large external text corpus 20 may be gradually reduced when linguistic units iteratively are compared to, and found to be different from, those in the seed corpus. *Bandara et al.* teaches a method for adapting the size of a language model in a speech recognition system, where an acoustic distance is calculated, and the contents of the language model are reduced with respect to acoustic distance. (Column 5, Lines 20 to 63: Figure 2) The stated advantage is the size of the language model is reduced, while retaining accuracy. (Column 3, Line 56 to Column 4, Line 24) It would have been obvious to one having ordinary skill in the art to reverse the language model building process of *Ramaswamy et al.* as suggested by *Bandara et al.* for the purpose of reducing the size of the language model, while retaining recognition accuracy.

Regarding claims 10 and 11, *Ramaswamy et al.* discloses a method for generating a language model and acoustic models of linguistic units in speech recognition.

7. Claims 3, 4, 5/3, 5/4, 6/5/3, and 6/5/4 are rejected under 35 U.S.C. 103(a) as being unpatentable over *Ramaswamy et al.* in view of *Bandara et al.* as applied to claims 1 and 2 above, and further in view of *Klakow ("Language-model optimization by mapping of corpora")*.

Concerning claim 3, *Ramaswamy et al.* discloses calculating a relevance score, but omits a selection criteria of the equation. However, *Klakow ("Language-model optimization by mapping of corpora")* discloses mapping of training corpora by an n-gram perplexity criterion involving the equation. (Page 702, Left Column) This is stated to have the advantage of reduced perplexity for speech recognition applications. (Page 701) It would have been obvious to one having ordinary skill in the art to apply the equation taught by *Klakow ("Language-model optimization by mapping of corpora")* as the relevance score of *Ramaswamy et al.* for the purpose of reducing perplexity in speech recognition applications.

Concerning claim 4, *Bandara et al.* discloses calculating the language model parameters based upon trigram, bigram, and unigram probabilities (column 2, lines 20 to 67).

Concerning claim 5/3 and 5/4, *Ramaswamy et al.* discloses a test corpus ("test text") is used by model checker 70 to evaluate the language model quality, calling for further language building iterations, if necessary, until its quality is satisfactory (column 3, lines 6 to 14; column 3, line 64 to column 4, line 7).

Concerning claim 6/5/3 and 6/5/4, *Ramaswamy et al.* discloses iterative corpus extractor computes a relevance score based upon a perplexity measure relative to a threshold to determine how many linguistic units to add to the language model (column 4, lines 7 to 54).

Response to Arguments

8. Applicants' arguments filed 26 November 2003 have been fully considered but they are not persuasive.

Regarding the rejection of claims 1 to 6, 8, 10, and 11 under 35 U.S.C. 102(a) as being clearly anticipated by *Klakow ("Selecting articles from the language model training corpus")*, Applicants argue the reference fails to disclose or suggest the new limitation, wherein the reduction of the corpus takes place "until a predefined criterion is met". This position is traversed.

Klakow discloses a method of reducing the size of a training corpus by removing articles A_i, wherein the selection criterion is the unigram perplexity. The change in the log-likelihood when an article A_i is removed is given by Equation (1). Similar changes of log-likelihoods are utilized as selection criteria for bigram and trigram language models. Page 1695, Right Column, states:

> The crucial question is the selection criterion to be used to judge which articles to remove. As we want to minimize the perplexity of the test data this is the obvious choice also for the selection criterion. This means that during training the perplexity on the target corpus has to be optimized.

Klakow also says the OOV-rate is related to the perplexity (Page 1697: Figure 6), and is also used for determining the articles in the language model. Compare to Page 4, Lines 25 to 31 of the Specification, where it is stated that the criterion for the reduction of the text corpus "is, for example, the perplexity or the OOV (Out-Of-Vocabulary rate) of the language model that results from the reduced text corpus . . . ." Thus, *Klakow* discloses a method of reducing the size of the

training corpus by a selection criterion involving the perplexity or the OOV rate which is identical to that disclosed by Applicants' Specification.

Applicants also state they are in the process of obtained a certified translation of their priority application, which antedates *Klakow*. However, the rejection stands until such time as the translation is received.

Regarding the rejections of claims 7 and 9 under 35 U.S.C. 102(e) as being anticipated by *Ramaswamy et al.*, and of claims 1, 2, 5/1, 5/2, 6/5/1, 6/5/2, 8, 10, and 11 under 35 U.S.C. 103(a) as being unpatentable over *Ramaswamy et al.* in view of *Bandara et al.*, Applicants again argue the references fail to disclose or suggest the new limitation of "until a predefined criterion is met". This position is traversed.

Ramaswamy et al. discloses that when a sufficient number "n" of linguistic units have been so extracted ("until a predefined criterion is met"), language model constructor 50 uses all the data in seed corpus 15 and relevant corpus 40 to construct a new reference language model 80 in step S4. The number n can either be a predetermined fixed number or a number that dynamically varies with each language model building iteration. For example, n may be set based upon a target percentage change in the size of the relevant corpus, so that the current iteration (of adding linguistic units to relevant corpus 40) can be considered complete if relevant corpus 40 increases by a certain percentage. Also, model checker 70 evaluates the language model quality, calling for further language building iterations, if necessary, until its quality is satisfactory ("until a predefined criterion is met"). (See Column 3, Line 45 to Column 4, Line 7: Figures 1 and 2) Thus, *Ramaswamy et al.* at least meets the claimed

limitation of "until a predefined criterion is met" in an embodiment where the number "n" of target units added can be set based upon a target percentage change in size of the relevant corpus. The size of the corpus is gradually extended in *Ramaswamy et al.* until "n" target units are added, wherein the "n" target units are the predefined criterion.

It is to be noted that Applicants' Remarks suggest independent claim 9 is amended in a manner analogous to independent claim 7 to include the new limitation of "until a predefined criterion is met". However, independent claim 9 does not, in fact, incorporate the new limitation of "until a predefined criterion is met".

Therefore, the rejections of claims 1 to 6, 8, 10, and 11 under 35 U.S.C. 102(a) as being clearly anticipated by *Klakow ("Selecting articles from the language model training corpus")*, of claims 7 and 9 under 35 U.S.C. 102(e) as being anticipated by *Ramaswamy et al.*, of claims 1, 2, 5/1, 5/2, 6/5/1, 6/5/2, 8, 10, and 11 under 35 U.S.C. 103(a) as being unpatentable over *Ramaswamy et al.* in view of *Bandara et al.*, and of claims 3, 4, 5/3, 5/4, 6/5/3, and 6/5/4 under 35 U.S.C. 103(a) as being unpatentable over *Ramaswamy et al.* in view of *Bandara et al.*, and further in view of *Klakow ("Language-model optimization by mapping of corpora")*, are proper.

Conclusion

9. Applicants' amendment necessitated the new grounds of rejection presented in this Office action. Accordingly, **THIS ACTION IS MADE FINAL**. See MPEP § 706.07(a). Applicant is reminded of the extension of time policy as set forth in 37 CFR 1.136(a).

A shortened statutory period for reply to this final action is set to expire THREE MONTHS from the mailing date of this action. In the event a first reply is filed within TWO MONTHS of the mailing date of this final action and the advisory action is not mailed until after the end of the THREE-MONTH shortened statutory period, then the shortened statutory period will expire on the date the advisory action is mailed, and any extension fee pursuant to 37 CFR 1.136(a) will be calculated from the mailing date of the advisory action. In no event, however, will the statutory period for reply expire later than SIX MONTHS from the date of this final action.

Any inquiry concerning this communication or earlier communications from the examiner should be directed to Martin Lerner whose telephone number is (703) 308-9064. The examiner can normally be reached on 8:30 AM to 6:00 PM Monday to Thursday.

If attempts to reach the examiner by telephone are unsuccessful, the examiner's supervisor, Richemond Dorvil can be reached on (703) 305-9645. The fax phone number for the organization where this application or proceeding is assigned is (703) 872-9306.

Any inquiry of a general nature or relating to the status of this application or proceeding should be directed to the receptionist whose telephone number is (703) 305-4700.

ML

RICHEMOND DORVIL
SUPERVISORY PATENT EXAMINER

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1/28/04